

CLAIMS

- 5 1. Device for the characterisation of a flowing substance (20) comprising:
- a transport duct (30) on which is mounted a heating or a cooling element (40),
 - a temperature difference sensor (50) comprising a first temperature measurement cell (51) downstream of the heating or cooling element and means (52) to determine a temperature difference in the flowing substance upstream and downstream of the heating or cooling element,
 - 10 — flow control means comprising flow measurement means (61) for measuring a mass flow characteristic and flow correction means (62) for correcting for measured mass flow variations, and
 - evaluation means (70) for evaluating a characterising feature of the flowing substance comprising a function relating temperature differences measured on one or more calibration substances to one or more characterising features of the flowing substance.
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2. Device according to claim 1, characterised in that the function is a data-base or a calibration equation.
- 25 3. Device according to claims 1 to 2 characterised in that the device also comprises a flow rate means for adjusting flow through the transport duct in a detection range of the temperature difference sensor.
- 30 4. Device according to claims 1 to 3 characterised in that the flow measurement means (61) comprise a pressure measurement cell (90) for measuring a pressure difference over the temperature difference sensor (50) and the flow correction means (62)

comprise pressure difference control means (91) for maintaining a substantially constant pressure difference over the temperature difference sensor.

5. Device according to claims 1 to 3 characterised in that the flow measurement means (61) comprise a pressure measurement cell (90) for measuring a pressure difference over the temperature difference sensor (50) and the flow correction means (62) comprise computing means for mathematically correcting the measured temperature difference for a measured pressure difference variation.
- 10 6. Device according to claims 1 to 3 characterised in that the flow measurement means (61) comprise a mass flow sensor (110) measuring the mass flow through the temperature difference sensor (50) and the flow correction means (62) comprise mass flow control means (91) for maintaining a substantially constant mass flow through the temperature difference sensor (50).
- 15 7. Device according to claims 1 to 3 characterised in that the flow measurement means (61) comprise a mass flow sensor (110) measuring the mass flow through the sensor (50) and the flow correction means (62) comprise computing means (111) for mathematically correcting the measured temperature difference for a measured mass
- 20 flow variation.
8. Device according to claims 6 or 7, characterised in that the mass flow sensor (110) is a coriolis-, an ultrasonic or a sonic nozzle mass flow sensor.
- 25 9. Device according to claims 1 to 8, characterised in that the device also comprises temperature correction means to correct for an absolute temperature variation in the flowing substance.
- 30 10. Device according to claim 9, characterised in that the temperature correction means comprise temperature measurement means and calculation means (122) for

mathematical correction of the measured temperature difference over the sensor (50) for a measured absolute temperature variation.

11. Device according to claims 1 to 10, characterised in that the device also comprises
5 pressure correction means to correct for an absolute pressure variation in the flowing substance.

12. Device according to claim 11, characterised in that the pressure correction means
10 comprises a pressure control for maintaining a substantially constant absolute pressure in the flowing substance.

13. Device according to claim 1 to 5, characterised in that the flow measurement means
(61) comprise a pressure measurement cell (90) for measuring a pressure difference
15 over the temperature difference sensor (50) and that the device further comprises temperature correction means to correct for an absolute temperature variation in the flowing substance and pressure correction means to correct for absolute pressure variations in the flowing substance.

14. Device according to claims 1 to 13 characterised in that the transport duct (30) is
20 mounted as a by-pass (140) on a main duct (141) in which a part of the substance flows from the main duct through the transport duct and sensor and back into the main duct.

15. Device according to claims 1 to 14, comprising a switch (160) for switching on and off
25 the flow control means, wherein, in the off-position, the device measures a flow rate of the flowing substance through the transport duct.

16. Device according to claim 15, comprising means for intermittently switching the switch
30 to the on- and the off position and means to control the flow rate of the flowing substance in the off-position of the switch at a level determined by a characterising feature of the flowing substance determined in the on-position of the switch.

17. Use of a device according to claims 1 to 16 for the identification of a flowing substance.

18. Use of a device according to claims 1 to 16 for controlling the flow of a fuel to deliver a controlled heat of combustion.

19. Use of a device according to claims 1 to 16 for the determination of the heat capacity of a flowing substance.

20. Use of a device according to claims 1 to 16 for the identification of the source or supplier of a flowing substance.

21. Method for the characterisation of a flowing substance comprising the steps of

— Locally heating or cooling a substance flowing through a transport duct by a heating or cooling element,

— Determining a temperature difference in the flowing substance upstream and downstream of the heating or cooling element,

— Controlling mass flow of the flowing substance in the transport duct by measuring a mass flow characteristic and correcting for measured variations in the mass flow characteristic,

— comparing the measured temperature difference with corresponding temperature differences measured on one or more calibration substances for evaluating a characterising feature of the flowing substance, andDe conclusie is nu op verschillende manieren verruimd tot het oorspronkelijke idee:

22. Method according to claim 21 wherein the measured mass flow characteristic is a pressure difference over the heating- or cooling element and wherein the mass flow is corrected for a measured pressure difference variation to maintain a substantially constant pressure difference over the element.

23. Method according to claim 21 wherein the measured mass flow characteristic is a pressure difference over the heating- or cooling element and wherein the measured temperature difference is corrected mathematically for a measured pressure difference variation.

24. Method according to claim 21 wherein the measured mass flow characteristic is a real mass flow rate in the transport duct measured with a mass flow sensor and wherein the mass flow rate is corrected for a measured mass flow rate variation to maintain a substantially constant mass flow rate.

25. Method according to claim 21 wherein the measured mass flow characteristic is a real mass flow rate in the transport duct measured with a mass flow sensor and wherein the measured temperature difference is mathematically corrected for a measured mass flow rate variation.

26. Method according to claim 21 wherein the measured mass flow characteristic is a pressure difference over the heating- or cooling element and wherein the mass flow rate is corrected for the measured pressure difference variation to maintain a substantially constant pressure difference over the element and wherein further correction is made for absolute temperature variations and absolute pressure variations in the flowing substance.

27. Method according to claims 21 - 26 wherein the flowing substance is identified by retrieving from a database the identity of the calibration substance with the best corresponding temperature difference measurement.

28. Method according to claim 21 to 26 wherein the flowing substance is a natural gas and wherein the natural gas is characterised by measuring the temperature difference and retrieving from a database or function, relating temperature difference measurements of different natural gasses with one or more characterising features of said natural gasses, the characterising feature relating to the measured temperature difference measurement.

29. Method according to claim 28 wherein the database or function comprises the heat of combustion of calibration gasses and the temperature difference measurement is used to determine the heat of combustion of the gas.

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30. Method for the combustion of a combustion gas wherein the combustion gas is characterised according to method claim 29 and mixed with an oxygen containing gas in a mixing ratio based on the measured temperature difference.

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